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ABSTRACT

Sixty-five severely hearing impaired elementary school age children were randomly assigned to four treatment conditions to compare the effectiveness of attention training and self instruction in controlling Ss' impulsivity. Ss were assigned to either (1) attention training via self instruction, (2) attention training, (3) self instruction, or (4) materials control. Self instruction and attention training were modeled and taught in a total communication mode. Results showed no significant effects for total subject analyses, but analyses with only the impulsive Ss revealed the attention training component to be more effective than self instruction in reducing impulsivity on the Matching Familiar Figures posttest 5 days after training. Impulsive Ss generalized a slower response time to a similar format test, but not to a task of a different format. (Author/CL)

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Self-instruction and Impulsivity Control by Deaf Chidlren

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Abstract

Sixty-five severely hearing impaired elementary school age children were randomly assigned to four treatment conditions: I. Attention Training via Self-instruction; II. Attention Training; III. Self-instruction; IV. Materials Control. Self-instruction and attention training were modeled and taught in a total communication mode. Results showed no significant effects for total subject analyses, but analyses with only the impulsive children revealed the attention training component to be more effective than the Self-instruction component in reducing impulsivity on the Matching Familiar Figures (MFF) post-test given five days following training. Impulsive subjects generalized a slower response time to a test that had a format similar to the MFF, but did not generalize to a task of a different format.

Self-instruction and Impulsivity Control by Deaf Children

Several investigators have trained hearing school aged children to use self-verbalization and attention deployment strategies to modify impulsive responding (e.g. Bender, 1976; Egeland, 1974; Meichenbaum & Goodman, 1971) on perceptual tasks such as the Matching Familiar Figures test (MFF) (Kagan, Rosman, Day, Albert, & Phillips, 1964), a match-to-sample visual discrimination task. The results of these investigations have shown that both verbal self-instruction and attention training improve performance on visual motor tasks (Pressley, 1979). Only in the Meichenbaum and Goodman study (1971) did the combination of self-verbalization and attention training show a clear superiority over an attention training only condition. Bender (1976) found a facilitative effect for the combined self-instruction/attention training condition over attention training, self-instruction or control treatments in longer latency, but not a significant decrease in errors. Guralnich (1976) found that mentally retarded children who had a combined self-instruction/attention training condition had better match-to-sample performance than similar subjects who had only attention training with no instructions to use it. These results did not generalize to the MFF. Thus, while there is a suggestion that attention training taught via self-instruction can increase impulsivity control over an attention training treatment, Pressley (1979) warns that it is not possible to delineate specifically the effects of attention training and self-instruction from the existing evidence.

One purpose of the present study was to compare the efficacy of these two components--attention training and self-instruction--to control impulsivity in a deaf population with a language deficit. Luria and Yudovitch (1971) suggest that due to the fact that the deaf child is "excluded from speech

communication because of his defect in hearing, he does not possess all those forms of reflection for reality which are realized through verbal speech" (p. 32). Likewise, Oleron (1977) has stressed that deaf children have less experience in the regular use of language which provides a break during which analysis and thought can occur. Furth (1971) has found that deaf children show developmental advances similar to hearing age peers on Piagetian tasks of thinking, but may show a lag on tasks where language is an important component. Thus, it is expected that the self-instruction component will not show the facilitative effects on impulsivity control for deaf subjects as it did for hearing children.

A second purpose of this study was to test for generalization of training to other tasks. Pressley (1979) has noted that there is almost no evidence that the effects of self-instruction or attention training generalize beyond the training task situation. Transfer task A required the child to circle all the pictured items of a given conceptual category, such as apples, clothes, flowers, chairs, etc. This task was different from the trained matching task, but could be done using some of the trained strategies such as going slowly and carefully and looking for similarities and/or differences. Besides time and errors as indicators of transfer of training, subjects were asked to tell how they planned to do the first item. The transfer task B format was similar to the MFF, but the stimuli were geometrical designs. This task was designed to determine if training on picture stimulu would transfer to time and error differences between treatments with geometric stimuli.

The third purpose for the present study was an instructional question. Will training facilitate task performance for all the children, regardless of their degree of reflectivity, or does it only affect impulsive children? This question arises from findings that observation of a reflective or impul-

sive model or teacher can change the children's MFF responses (e.g. Denney, 1972; Yando & Kagan, 1968).

It was predicted that in the present study: 1) the attention training component would have more effect on impulsivity control than the self-instruction component of training; 2) subjects would transfer training to a task with similar format (task B), but would show little transfer to task A, which was very different in format, but could be done using some of the trained attention deployment strategies; and 3) attention training would have a facilitative effect on MFF performance for impulsive subjects while there would be no differential effects of the four treatments on the total subjects' analyses.

Method

Subjects

The subjects were 67 elementary school aged children attending the California School for the Deaf, a residential facility in southern California, whose parents gave permission for them to participate in the project. All subjects were administered the MFF by an experienced ex-teacher of deaf children three to four weeks before training started. Subjects scoring above the median of 10 errors and below the median of 13.8 seconds were designated as impulsive (Kagan et al., 1964). Twenty-two children were impulsive, 19 were reflective, and the remainder fell into the other two quadrants as a result of the double median split. Subjects in the four quadrants were randomly allocated to the treatment conditions: I. Self-instruction/Attention Training, II. Attention Training, III. Self-instruction Training, and IV. Materials Control. Two subjects were dropped after the first day of training, one due to suspension and one to voluntary withdrawal, thus giving a total of 65 children receiving training. There were 16 children in

each of three conditions, and 17 subjects in the Attention Training condition. There were five, six, five and six impulsive subjects, and five, five, five and four reflective subjects in Conditions I-IV respectively. Separate analyses for the impulsive subjects were conducted to determine if training was differentially effective. Analyses of fast accurate, slow inaccurate, and reflective subjects were not attempted because some cells would only have two or three subjects. Subjects in the four conditions did not vary significantly as to IQ on the WISC-R Performance Scale, $F_{3,61} = .44$, NS; chronological age, $F_{3,61} = .25$, NS; degree of hearing impairment, $F_{3,61} = .55$, NS; pre-MFF time, $F_{3,61} = .32$, NS; and pre-MFF errors, $F_{3,61} = 1.42$, NS; as revealed by one-way unweighted means analyses of variance. Characteristics of the subjects are summarized in Table 1.

Insert Table 1 about here

Likewise the impulsive subjects in the four conditions did not vary significantly as to IQ, $F_{3,18} = .91$, NS; age, $F_{3,18} = .13$, NS; degree of hearing loss, $F_{3,18} = .32$, NS; pre-MFF time, $F_{3,18} = .11$, NS; and pre-MFF errors, $F_{3,18} = .34$, NS; as revealed by similar analyses.

Degree of hearing impairment was coded in six categories according to the decibel loss (average of the hearing levels at 500, 1000, and 2000 Hz. on an unaided audiometric test): 1. -10 to 26 db (normal limits); 2. 27-40 db (mild hearing loss); 3. 41-55 db (moderate hearing loss); 4. 56-70 db (moderately severe hearing loss); 5. 71-90 db (severe hearing loss); and 6. more than 90 db (profound hearing loss) (Davis, 1970). There was one subject in the moderately severe range, and the rest had severe to profound hearing loss. Subjects were prelingually deafened with rubella, Rh factor, meningitis, hereditary, and unknown etiologies. All but four subjects had hearing parents. There were 40 males and 25 females in the sample.

Materials

Assessment instruments. The same 12 item MFF test was given in the prescribed manner (Kagan et al., 1964) as a screening instrument and about five weeks later as a posttest. Transfer tasks A and B each had six items. Task A, in which subjects were asked to circle all examples of a given conceptual category, consisted of six pages with different arrays of objects on each page. When handed the first item, subjects were told: "Circle the apples. Before you start tell me how you are going to do this." After the first item, subjects were instructed, "Circle the _____." The experimenter recorded time to circle the items, errors, and any signs or utterances made by the child previous to starting the first item. Responses to the first item were categorized as stating: 1. Trained strategies, a. looking carefully and slowly (e.g. "I will go slowly and carefully", "I will find the apples and be careful.") and b. similarities/differences (e.g. "I find all the same apples," "circle all the same apples", "copy apple"); 2. Strategies from directions (e.g. "apples, yes", "circle apples", "pick apples", count or indicate apples); and 3. No strategies indicated (e.g. "Don't know", "How? I am fine", or no response). Transfer Task B was similar in format to the MFF, but geometric designs replaced the familiar figures. Subjects were instructed: "Point to the one down here that is just like the one up here." The experimenter recorded time to make the first choice and total errors.

Training materials. The materials used in the four training lessons varied from raised letters which stimulated kinesthetic discrimination to outline drawings which required visual discrimination. In Lesson A, letter rubber stamps from a child's printing set were used. Lesson B employed animal rummy cards, some of which were slightly altered by the experimenter.

The material in Lesson C consisted of humorous outline drawings of monkey heads. The seven dwarfs from a paper doll book were xeroxed and employed in Lesson D. The number of alternatives (i.e., the number of items from which the child chose a match) given for the matching tasks used in training increased from two to three in Lessons A and B, two to five in Lesson C, and four to six in Lesson D. From one to three features on a set of material for a trial differed; the number of features varied increased as the lessons progressed. There were seven trials for Lesson A, eight trials for Lesson B, and six trials for Lessons C and D.

Procedure

Each subject was individually screened in a 10-15 minute session on the MFF about four weeks before training began. Children were pretested and tutored by an experienced former teacher of deaf children. Each subject in the four conditions was individually tutored on four consecutive days in sessions ranging from 10-25 minutes depending on the treatment and the pace of the subject. Each subject had the same number of trials on the same material. Approximately five days after training the children were individually posttested on the MFF and transfer tasks A and B by a different experimenter that was not familiar to the children or aware of the training condition to which subjects had been assigned. She was experienced in testing deaf children and used total communication adeptly.

Self-instruction/Attention Training condition. The self-instruction component was modeled by the tutor before the subject attempted self-instruction. The subject first observed the tutor self-instruct herself. For example: "Watch how I do this so that you will know how to do the rest. OK, I am going to find the one to match the one up there [indicate standard]. I am going to go slowly and carefully so I won't make a mistake. First, I'll look

at these two and see if they have different parts...." [The tutor reinforced herself during the training by saying when the correct match was found,] "Very good, [experimenter's name]." Then the child did the same task or a similar one. The tutor and subjects used total communication, i.e. signing and speaking simultaneously. Subjects varied as to the degree of speaking, but every child spoke at least some of the signed concepts. The manual communication system used was Signed English. On each set of tasks, the subject overtly used total communication self-instruction until he was doing it correctly, usually two or three trials. Then the tutor told the subject to "think about signs and words, but do not sign or talk." The tutor modeled again if the child did not easily self-instruct. Thus, overt self-instruction was faded to covert self-instruction as soon as the subject was employing it correctly. The elements verbalized and signed, first by the tutor and then by the subject, were as follows: (a) general directions about what response the task required and to go slowly and carefully; (b) specific attention deployment directions about how to do the task, uttered before the subject acts and incorporating the specific strategies employed; and (c) self-reinforcement.

The attention training component used strategies similar to those found by Siegelman (1969) to be characteristic of reflective responders and employed in training studies by Nelson (1968) and Egeland (1974). The strategies were sequentially developed in the four lessons. Lesson A focused on comparing two letters at a time to find the parts that were different in order to select a match the same as the standard. Tracing was used in both of the strategy training conditions. Differences, rather than similarities, were stressed because of evidence that young children scan a limited area of the stimulus, and if no objective differences are found, make a judgment of similarity (Vurpillot, 1968). A strategy that focused on similarities between pictures

would not train skills the young child needs to do a visual discrimination task well.

The attention training in Lesson B stressed sequential comparison of parts on two cards to find differences, comparison with the standard to see if those different parts were the same or different from the standard, and discarding to one side those cards different from the standard until the match was found. The subject pointed to equivalent parts on the two cards. In Lesson C, in addition to the strategies already learned and continued from Lesson B, the subjects were also trained to compare parts from the top down on two pictures, compare two adjacent alternatives for different parts, and cover discarded alternatives until the match was found. The subject pointed to equivalent parts on two pictures. In the last lesson, the strategies taught previously were reinforced. The subject did not cover discarded alternatives with cards. Instead they remembered which ones were "out."

Attention training condition. The attention deployment strategies used in the above condition were also taught to these subjects. The tutor did all the signing/verbalizing and reinforcing, while the child pointed and answered "yes" or "no" to questions posed by the tutor. Number of trials, reinforcements and repetitions of strategy instructions were the same in both treatments. Words and signs used by the tutor and child in the Self-instruction/Attention Training condition to give specific attention deployment directions about how to do the task were the same as what the tutor said and signed in this condition.

Self-instruction condition. These subjects were trained to self-instruct about the general task, but not any specific strategies. For example: "I am going to find the one that matches the one up there. I am going to go slowly and carefully so I won't make a mistake." The tutor did not model

any scanning with the eyes or verbalize and sign any other strategies. After a pause the tutor would indicate the correct alternative and reinforce herself. As in the first condition, the child did not use overt self-instruction after the first two or three trials of every set of tasks.

Materials control. The control group subjects were told to look at the materials; they were not asked to match or say and sign anything. They were reinforced with "Good" after they had glanced at the material.

Results

MFF Posttest

The MFF posttest data for all subjects were submitted to two factor (Attention training X Self-instruction) unweighted means analyses of variance. There were no significant attention training effects, $F_{1,61} = .36$, NS, self-instruction effects, $F_{1,61} = .01$, NS, or interaction, $F_{1,61} = .07$, NS, for errors. Likewise for time, the main effects of attention training, $F_{1,61} = .02$, NS, and self-instruction, $F_{1,61} = .00$, NS, and the interaction, $F_{1,61} = .00$, NS, were not significant. Means and standard deviations are shown in Table 2.

Insert Table 2 about here

The impulsive subjects' data were submitted to two factor (Attention Training X Self-instruction) unweighted means analyses of variance. On the MFF errors analysis the main effect for Attention Training approached significance, $F_{1,18} = 4.04$, $p < .056$, the interaction was significant, $F_{1,18} = 4.69$, $p < .041$, and the self-instruction factor was not significant, $F_{1,18} = .38$, NS. Scheffé post hoc comparisons revealed no significant differences between the means. The MFF time analysis revealed a significant main effect for attention training, $F_{1,18} = 7.21$, $p < .014$, a nonsignificant main effect for self-instruction, $F_{1,18} = .63$, NS, and a significant interaction, $F_{1,18} = 9.25$, $p < .006$. Scheffé post hoc comparisons show a significant difference only between the attention

training/Self-instruction and the Self-instruction conditions. See Table 2 for means and standard deviations.

The first prediction that the attention training component would have more effect on impulsivity control than the self-instruction component was partially supported for the impulsive deaf children, but not for all subjects. The attention training is only marginally significant for errors in the impulsive subjects' analysis. The third prediction that attention training would have a facilitative effect on MFF performance for impulsive deaf children, while there would be no differential effect of the four treatments on the total subjects' analyses was supported.

Transfer tests

Transfer task A data for all subjects were submitted to two factor (Attention training X Self-instruction) unweighted means analyses of variance. There were no significant main effects or interactions for the time or errors analyses (Fs range from .01 to 1.52). Similar analyses for impulsive subjects show the same nonsignificant main effects and interactions for both time and errors. See Table 2 for means and standard deviations.

Responses subjects made to the first item on transfer task A were categorized as to: 1. Trained strategies, 2. Strategies from directions given on Item 1, and 3. No strategy indicated. Only three subjects gave responses that indicated plans to look for similarities or differences and/or to look carefully and slowly, strategies that could have been transferred from training. A summary of the responses given by subjects before they did the first item on transfer task A is found in Table 3. These results indicate

Insert Table 3 about here

that most students did not transfer trained strategies to a new task.

Task B data, from a transfer task very similar in format to the MFF but using geometric stimuli, were submitted to two factor (Attention training X Self-instruction) unweighted means analyses of variance. The errors and time analyses for total subjects showed no significant main effects or interactions (Fs range between .08 to 1.13). The time analysis for impulsive subjects revealed a significant attention training factor, $F_{1,18} = 5.05$, $p < .035$, a nonsignificant self-instruction factor, $F_{1,18} = 1.14$, NS, and a significant interaction $F_{1,18} = 10.85$, $p < .004$. The errors analysis for impulsive children did not show the same pattern however. There were no significant main effects for attention training, $F_{1,18} = .36$, NS, or self-instruction, $F_{1,18} = .03$, NS. The interaction was also nonsignificant. Scheffé post hoc comparisons revealed significant differences in latency only between the Attention training/Self-instruction and Self-instruction conditions. The second prediction that subjects would transfer training to a task with a similar format, but would show little transfer to a task with differing format (even though trained strategies would help the child do the task) was partially supported for impulsive subjects. Only the response time on Task B was affected by the attention training, errors were not significantly different.

Discussion

Results showed that the attention training component had a significant effect on increasing latency and a nonsignificant trend to decrease errors on the MFF for impulsive subjects. There was no significant main effect for the self-instruction component. The attention training/self-instruction treatment was not significantly more effective than the attention training

treatment although the data for impulsive subjects were in that direction. The attention training/self-instruction treatment was significantly more effective in increasing response time for impulsive subjects on the MFF and the transfer task B than the self-instruction treatment. Thus, these impulsive deaf children appear to learn to control impulsivity better when specific attention training is included. The data suggest self-instruction training does not have a significant effect. This trend was not found with hearing impulsive children (Bender, 1976) who had a similar training sequence. That study found a significant main effect for self-instruction in both time and errors on an immediate posttest similar in format to the MFF. The attention training factor shows a significant effect only for latency. There were no significant MFF posttest effects. Given the literature that shows that deaf children do not perform as well as hearing children on tasks that have a strong language component (e.g. Furth, 1971), it is reasonable to suggest that these deaf children did not significantly benefit from self-instruction training due to a language deficit. Most of the children did not start using signing or total communication until four or five years of age.

Borkowski and Cavanaugh (1979) distinguish between maintenance, where there is an effect on a task similar to the training task, and generalization, where there is transfer of training to a different task. The MFF and Task B assess maintenance, with Task B having different stimuli than used in training, but having the same task demands. Task A measures generalization. Analyses of the impulsive subjects data showed maintenance on the MFF and Task B for time, while there was no evidence of generalization. Thus, there was maintenance of a general slowing down strategy, but the specific attention deployment strategies trained were only marginally effective for maintenance on picture stimuli and were not maintained where geometric stimuli were used.

This grim picture of maintenance and generalization of impulsivity control skills is congruent with the literature (Pressley, 1979).

The results also indicate that the attention training is only facilitative for impulsive deaf children. Teachers would not want to use these training techniques with all children. Certain impulsive responders would probably benefit from training, however. The thrust of this training for deaf children should be on attention deployment strategies, with self-instruction given a smaller role.

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Table 1

Characteristics of Subjects

in Four Treatment Conditions

	Attention training/ Self-instruction		Attention Training		Self-instruction		Control	
	M	SD	M	SD	M	SD	M	SD
Age[b]								
Total[a]	125.2	21.3	124.6	17.4	126.2	17.6	129.7	15.6
Impulsive	119.0	17.6	119.2	12.1	119.6	18.3	124.3	18.3
WISC-R Performance IQ								
Total	102.5	12.3	101.5	15.1	98.9	12.4	98.1	11.3
Impulsive	97.8	8.9	101.0	15.1	99.2	7.7	98.7	11.5
Hearing Impairment[c]								
Total	5.9	.3	5.7	.6	5.9	.3	5.8	.4
Impulsive	5.8	.4	5.8	.4	6.0	.0	5.8	.4
Pre-MFF time								
Total	14.4	5.2	15.3	8.4	14.9	7.7	13.2	3.9
Impulsive	10.1	1.8	9.4	2.3	9.8	2.4	9.6	2.2

Table 1

Continued

	Attention training/ Self-instruction		Attention Training		Self-instruction		Control	
	M	SD	M	SD	M	SD	M	SD
Pre-Mff errors								
Total	11.4	7.9	8.5	4.1	7.5	4.9	9.8	5.3
Impulsive	15.8	10.9	12.3	2.9	13.0	1.4	14.3	5.4

[a]Total N equals 16, 17, 16, and 16 in Conditions I-IV respectively. Impulsive children numbered 5, 6, 5, and 6 in Conditions I-IV respectively.

[b]Chronological age in months

[c]Hearing loss is coded in 6 categories according to dB loss on an unaided audiometry test. All but one child is in the severe to profound range.

Table 2

Posttest Scores of Subjects

in Four Treatment Conditions

	Attention training/ Self-instruction				Attention training				Self-instruction				Control			
	Time		Errors		Time		Errors		Time		Errors		Time		Errors	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
MFF																
Total[a]	15.8	7.4	6.6	4.7	16.9	10.5	7.2	6.4	15.5	9.6	7.9	7.6	16.6	10.4	7.7	5.3
Impulsives	15.0	4.4	8.0	5.4	8.9	3.7	11.3	5.2	5.9	1.7	17.0	3.1	9.5	4.3	11.0	5.8
Task A																
Total	11.3	4.8	1.8	2.1	12.8	6.9	.8	1.7	10.3	2.6	1.4	2.5	12.1	6.4	1.6	2.4
Impulsives	11.1	5.6	3.0	3.1	10.0	1.8	1.0	1.5	11.7	3.7	2.6	4.2	15.4	9.4	2.7	3.1
Task B																
Total	10.7	5.3	3.8	3.7	12.1	10.3	3.3	3.4	9.8	5.5	2.7	2.7	10.1	5.7	2.7	2.6
Impulsives	10.3	2.6	5.0	5.2	6.3	1.7	5.7	4.2	5.2	.9	4.4	2.6	7.2	2.8	4.3	2.7

[a]Total N equals 16, 17, 16, and 16 in Conditions I-IV respectively. Impulsive children numbered 5, 6, 5, and 6 in Conditions I-IV respectively.

Table 3

Classes of Strategies Indicated

by Subjects in Four Treatment Conditions[a]

	Attention training/ Self-instruction	Attention training	Self-instruction	Control	Totals
Trained strategies					
Similarities/ Differences	2	1	0	0	3
Look slowly/ carefully	0	0	0	0	0
Total	2	1	0	0	3
Strategies from Directions	1	4	7	7	19
No Strategy Indicated	13	12	10	8	43

[a]Refers to Item 1 of Transfer task A i.e. "Tell me how you are going to do it before you start."